DREAM AND BELIEVE THEY CAN...Lead Your Students to Success and Improved Student Achievement in Mathematics Grades 3-12

A Special Program Design for
AWSP/WASA Summer Conference
Spokane, Washington

Monday, June 30, 2008
1:45 - 2:45 pm

presented by
Dr. Judee K. Axelsen
VISION INTO REALITY

"Past decades of the old drill and kill instruction does not produce results."

Education Leadership
February, 2004

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"Race, ethnicity, and poverty are poor excuses for low expectations."

Dr. Lorraine Monroe
Nothing's Impossible: Leadership Lessons From Inside and Outside the Classroom

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TO INCREASE STUDENT ACHIEVEMENT IN MATH

What Works	What Doesn't Work
Increased Attention	**Decreased Attention**
■ Assessing what students know and how they think about mathematics	■ Assessing what students do not know
■ Having assessment be an integral part of teaching	■ Having assessment be simple counting correct answers on tests for the sole purpose of assigning grades
■ Focusing on a broad range of mathematical tasks and taking a holistic view of mathematics	■ Focusing on a large number of specific and isolated skills organized by a content-behavior matrix
■ Developing problem situations that require the applications of a number of mathematical ideas	■ Using exercises or word problems requiring only one or two skills
■ Using multiple assessment techniques, including written, oral, and demonstration formats	■ Using only written tests
■ Using calculators, computers, and manipulatives in assessment	■ Excluding calculators, computers, and manipulatives from the assessment process
■ Evaluating the program by systematically collecting information on outcomes, curriculum, and instruction	■ Evaluating the program only on the basis of test scores
■ Using standardized achievement tests as only one of many indicators of program outcomes	■ Using standardized achievement tests as the only indicator of program outcomes

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"Students today must learn facts but they must also learn to be skilled 'information archeologists.' They must dig for information, make sense of it, and attach meaning to it. They're charged with getting the main ideas as well as their evidence. One of the greatest gifts we can give students is to teach them how to identify salient information and how to structure the information for meaning and application. Students need to learn to delete, substitute and keep information."

Rick Wormelie
Summarization in Any Subject: 50 Technologies to Improve Student Learning
ISBN 1-4166-0019-1

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"Success in tomorrow's job market will require more than computational competence. It will require the ability to apply mathematical knowledge to solve problems."

National Research Council
Helping Children Learn Mathematics
ISBN 0-309-08431-8

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"We can defend the past or the status quo, or we can get on with creating the future. No matter how good we are today, we need to become even better tomorrow."

Ten Trends: Educating Children for
a Profoundly Different Future

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The Essential Educational Question…

<u>Why</u>, based on <u>what</u>?

Don't get lost in the "how to" questions; they eat up your valuable time and get you nowhere if why and what are not the questions that drive you!

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"Being a 'warm demander' is the goal for all members of your school community as people rise to high expectations when those they respect have confidence that they will."

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"The clear message from the research is that schools can and do make a difference. If the knowledge and skills that students from advantaged backgrounds possess is learned rather than innate, then students who do not come from advantaged backgrounds can learn it too.

The most straightforward way to enhance students' academic background knowledge is to provide academically enriching experiences, particularly for students whose home environments do not do so."

Building Background Knowledge for Academic Achievement... Research on What Works in School.

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5 STRATEGIES OF MATHEMATICAL PROFICIENCY:

1. Understanding: comprehending mathematical concepts, operations and relations...knowing what mathematical symbols, diagrams and procedures means.

2. Computing: carrying out mathematical procedures, such as adding, subtracting, multiplying and dividing numbers flexibly, accurately, efficiently and appropriately.

3. Applying: formulating problems mathematically and devising strategies for solving them using concepts and procedures appropriately.

4. Reasoning: using logic to explain and justify a solution to a problem or to extend from something known to something not yet known.

5. Engaging: seeing mathematics as sensible, useful and doable, if you work at it, and being willing to do the work.

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The following table shows the prices for items sold at the school's bake sale, sponsored by the student council.

Item	Price Each	Price by the Box
Doughnuts	$.50	$5.00
Cookies	$.10	$1.00
Cakes	$5.00	-----
Pies	$8.00	-----

By the end of the first day, the student council had sold 20 single doughnuts, 5 boxes of doughnuts, 5 single cookies, 20 boxes of cookies, 11 pies and 10 cakes.

SOLVE IT

Mathematically Write a math sentence	In Contrast Write a story to match
Graphically Create a graph	Explanation Explain the —what, —how, —why to solve the problem

To overcome inequities in math instruction, NCTM recommends:

1. High expectations for all students.

2. A coherent standards-based curriculum of important mathematical concepts, articulated across grade levels.

3. Teachers who understand what students need to learn and then challenge and support them.

4. Instruction that builds new knowledge from experience and prior knowledge.

5. Assessment that supports learning and provides useful information to both students and teachers.

6. Technology that influences the mathematics taught and enhances students' learning.

Educational Leadership
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"Minority students as a group experience a less rigorous curriculum. Lower expectations for these students often preclude the opportunity for them to take more rigorous courses because of inadequate prior preparation. To succeed in mathematics, especially higher level math such as Algebra II and Calculus, all students must have access to and succeed in gateway courses such as Algebra I."

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IMPROVING STUDENT ACHIEVEMENT FOR EVERYONE IN MATHEMATICS GRADES 3-12

It is about:

- analyzing our data and using it to guide our decisions
- implementing vision, intentionality and focus
- using quality instruction linked to our standards
- students showing what they know on a daily basis
- becoming a "warm demander"

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- using interventions
  - "double dosing" in reading and math
  - before and after school interventions
  - skill groups for targeted "deficits"
- starting with the end in mind and striving for conceptual understanding
- using visualization to "cement" new learning and
- building relationships for learning.

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PROBLEM SOLVING STRATEGIES

- Look for a pattern.
- Construct a table.
- Make an organized list.
- Draw a picture.
- Use objects.
- Guess, check, and revise.
- Work backwards.
- Write an equation.
- Solve a simpler (or similar) problem.
- Make a model.
- Act it out with your study buddy.

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PROBLEM SOLVING STRUCTURE

1. State the problem in your own words.

2. List the important information.

3. What do you need to find out? What information do you not need?

4. What strategy would you use?

5. Solve the problem. Show your work. Use words, numbers, and/or visual representations.

6. Tell how you solved it. Explain your thinking.

7. Write the answer in a complete sentence.

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Problem Solving Strategies…Teaching Mathematics in Multiple Ways

1. Act it out or use objects (manipulatives). This helps students develop visual images of the data and problem solving.

2. Draw a picture or create a diagram; this leads to greater understanding and helps the student sort out what is important and what is not!

3. Make or use a table to organize data; this becomes an organizer for problem solving.

4. Make an organized list; this helps the student organize what has been done and what still needs to be completed.

5. Guess, check and revise; the student can use multiple strategies.

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6. Use or look for a pattern; by identifying a pattern, the student can make predictions and it is an important problem solving strategy.

7. Work backwards.

8. Use logical reasoning...key words
   If...then
   If...then...else
   If something is true, then...
   If something is not true, then...

9. Make it simpler...reading large numbers to small numbers, reducing the number of items in a problem allows the student to focus on the operation.

10. Brainstorm...looking at problems in new ways when you don't know what else to do. Encourage students to take a risk.

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Problem Solving

1. Restate the problem/question.

2. Find needed data:

3. Plan what to do:

4. Find the answer:

Step 1	Step 2	Step 3

Answer:

5. Check. Is your answer reasonable?

6. How do you know?

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VOCABULARY NEEDS TO BE INTENTIONALLY TAUGHT… BUT NEVER IN ISOLATION!

1. Students need to encounter words in context more than once to really learn them. Research shows that students need to be exposed to a word at least six times before they have enough experience to develop and remember meaning. Simply using "wide reading" is insufficient to develop new vocabulary.

2. Instruction in new words enhances learning words in context. When students have prior instruction on new words, their ability to comprehend new words increases by one-third. Even superficial instruction improved students' chances of understanding new words in context.

3. One of the most effective ways to learn new words is to associate an image (imagery). Research studies show a 37 per unit gain in achievement when imagery is used rather than having students focus on continual review of definitions; a 27 percent gain using imagery as opposed to having students write novel sentences that demonstrated use and understanding of new words was evident.

4. Systematic and direct vocabulary instruction works. Teaching vocabulary directly increases student comprehension of new material by a minimum of 12 percent.

5. Direct instruction on words that are critical to understanding new context generates the most powerful learning. Student achievement will increase by 33 percent when vocabulary instruction focuses on specific words that are essential to what the student is learning.

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TEACHING NEW VOCABULARY AND PHRASES ... WHAT DOES IT LOOK LIKE IN THE CLASSROOM

1. Present student with a brief explanation, description, demonstration, or scenario of the new term or phrase.

2. Present students with a non-linguistic (this is where imagery fits!) representation of the new term or phrase.

3. Ask students to generate (remember Bloom's Taxonomy?) their own explanations or descriptions of the term or phrase. (This is a great time for students to use journals or work in pairs).

4. Ask students to create their own non-linguistic representation of the term or phrase. (Graphic organizers or creating metaphors are effective at this step!)

5. Periodically ask students to review the accuracy of their explanations and representations. (Using this as an entry task or pre-reading task can be very effective.)

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STUDENTS NEED TO BE TAUGHT HOW TO READY FOR DETAILS ...FACTS, DATES, CAUSE AND EFFECT, TIME SEQUENCES, EPISODES AND MORE.

1. Students need systematic, multiple exposures to details. Students need to be exposed to details at least three to four times if they are to be expected to remember details or use them in a meaningful way. The "time window" for details is usually no more than a two day delay. The key, however, is to decide which details are relevant to enhance student learning and understanding. Exposure to details needs to allow students an opportunity to "manipulate" the details in different ways, i.e. discussion, generating additional details, video clips, time lines with narrative, additional reading, journaling, etc.

2. Details and "dramatic" instruction go hand in hand. When compared with verbal (lecture) and visual (reading, graphic organizers), dramatization significantly increased student achievement gains, short and long term.

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WARMUP - TRANSITION ACTIVITY
MATCH VOCABULARY TO WASL ASSESSMENT

MATH VOCABULARY

a = addend, add	n =
b =	o =
c =	p =
d =	q =
e =	r =
f =	s =
g =	t =
h =	u =
i =	v =
j =	w =
k =	x =
l =	y =
m =	z =

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Intentionally Teaching Math Vocabulary

Directions: Rate the following statistics terms as follows:

1. I've never heard of the word before.
2. I've heard the term, but I don't know how it applies to mathematics.
3. I understand the meaning of this term and can apply it to a mathematics problem.

mean_____

median_____

mode_____

weighted average_____

line of best fit_____

correlation_____

range_____

normal distribution_____

bimodal distribution_____

skewed distribution_____

flat distribution_____

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Vocabulary Needs to Be Intentionally Taught…embedded into every lesson, every day!

1. Vocabulary represents important concepts that are unique to each content areas.

2. Students need repeated exposure with words in oral and written contexts to build knowledge and use of word meanings.

3. Frequent exposures to words, through extensive reading in multiple forms, builds vocabulary development.

4. Learning new vocabulary builds in a continuum of learning, i.e., not knowing → familiar with the word → deeper meaning → use in many contexts.

5. Students need to encounter words in different contexts to build "mental structures" for word use. Each time new vocabulary is used, more information is added to the "mental structures."

6. Vocabulary can be learned in environmental and "out of school" experiences such as wide reading, discussion and listening, and exposure to appropriate media.

7. Focused and intentional vocabulary instruction is essential to content area learning.

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line of best fit_____

correlation_____

range_____

normal distribution_____

bimodal distribution_____

skewed distribution_____

flat distribution_____

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K-N-W-S Worksheet

K What facts do I KNOW from the information in the problem?	**N** Which information do I NOT need?	**W** WHAT does the problem ask me to find?	**S** What STRATEGY operation/tools will I use to solve the problem?

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MATH PROBLEM SOLVING

1. Understand the Problem

— Read the problem carefully; re-read if necessary
— Identify what the question is; highlight or circle key words
— Restate the problem in your own words
— Identify the information needed to solve the problem; is there missing information?

2. Make A Plan

— try a simpler problem
— make an organized list
— act it out
— use logical reasoning
— make a picture or diagram
— explain using words
— make a table
— look for a pattern
— guess and check
— work backwards
— use an equation
— explain using numbers

3. Use Your Plan

Solve the problem using the strategies you selected. You may need to change strategies.

4. Evaluate Your Plan

Did you...

— answer the questions being asked?
— check for reasonableness of solution?
— check the accuracy of your work?
— try another method to solve the problem; compare the results?
— generalize or extend your solution to other solutions or to solve other problems?

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WRITING AND MATH...a direct connect!

– Students construct knowledge and understanding

– Writing creates meaning to help students fit new learnings into existing structures

– Writing allows students to communicate their ideas and thinking processes

– Writing allows students to "show what they know"...to clarify, record and demonstrate their learning

– Writing allows students to apply new concepts

– Writing allows students to synthesize their ideas

– Writing helps students organize their ideas and evaluate new concepts.

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Ideas for Writing in Math:

– What is a fraction?

– Tell how to solve these problems

– Write and illustrate their own story problems

– Plan a field trip to include directions, transportation, menus, and budget

– Describe how a problem has been solved

– Make predictions

– Explain an incorrect answer

– What did I learn in math today?

– What is your favorite shape and why?

– What is multiplication?

– Problem solving journal

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– Create a word web - i.e., square
  what it looks like
  places squares are used
  characteristics
  how do you make one

– 10 things you do every day with math

– How to use a ruler; write directions and create measurement problems

– Ideas about circles

– What is money and how do I use it?

– What is probability?

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Writing Steps in Math

Five Step Method

Prompt= What am I being asked to do?
I need to find out...

↓

Information: What are the facts?
I know...

↓

Picture: What strategy will I use? What is the picture inside my head?
Show my thinking by drawing a picture of using numbers. Label it!

↓

Explanation: Explain what I did in my picture. (Tell strategy and the steps you used.)

The strategy I used...First...Then...Next...After that...Finally...

↓

Conclusion: Look back. Use words from the question to tell your answer. Check to be sure it makes sense!

Therefore...

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Learning Logs

Before learning – to activate and assess prior knowledge:

- Why do we use rulers (or scales or other measuring devices)?
- What do these symbols mean?
- Describe instances when you use addition at home.
- How is multiplication similar to addition?
- Make a web to describe some uses of fractions.

During learning – to help students identify how well they understand what is being covered in class:

- Explain how you know that 7 + 3 = 11 - 1
- How do you know what a story problem is asking you to do?
- Write a story problem where you need to calculate 5 x 7.
- Find examples in our classroom of the geometric shapes we are studying.
- Draw three pictures that demonstrate the concept of multiplication.

After the lesson – to help students reflect on their learning:

- I have trouble understanding....
- Write a note to a student who was absent from class and explain what we learned in class today about right triangles.
- Write a note to your parents explaining how you know when a shape has a line of symmetry.
- My favorite kind of story problem is....
- Explain how you could do the calculation 65 - 19 in your head.

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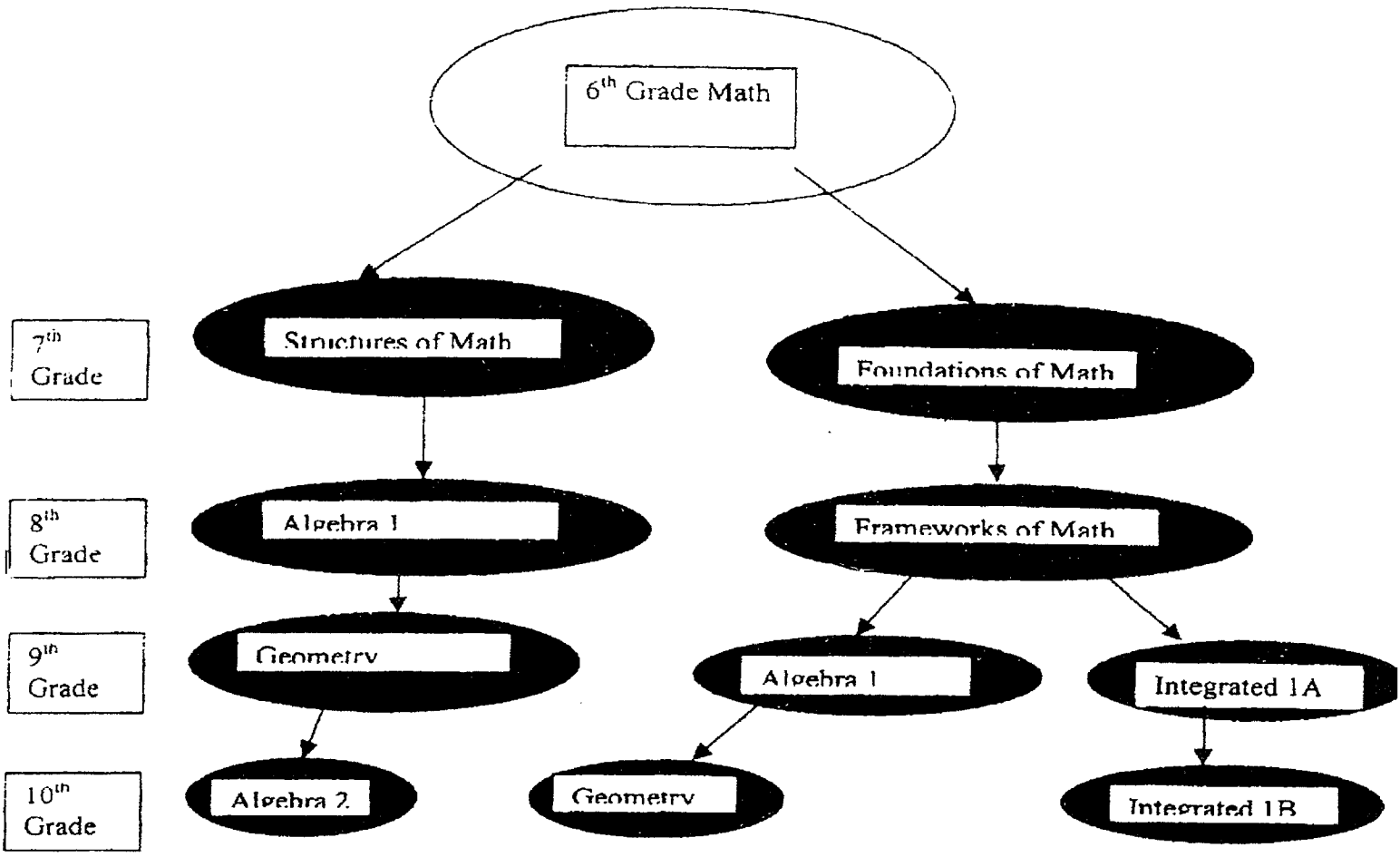
Grandview Sequence of Courses



Note: All students will be enrolled in sixth grade math which will emphasize addition, subtraction, multiplication, and division, fractions, decimals, and percents. Students will also be introduced to algebra, and geometric problem solving.

Students who are not achieving at grade level will be required to attend Summer Math Boot Camp prior to grade 6 if not performing at or near grade level or above.

Note: There are two math sequences; all students will have geometry and algebra by the end of grade 10.

MATH SUPPORT
to Serve Special Education Students for 2007-2008

Special education students will receive a "double dose" of math to support their learning and to provide interventions to help them learn specific skills. Math Support will be 41 minutes of direct instruction in a skills-based program. The goal of this year-long program is to bring student achievement closer to grade level. Students will make at lease two year's worth of growth within one academic year. The structure of Math Support is to provide targeted instruction, based on a variety of assessments, to teach students the math skills they will need to be successful in mainstream math using a spiraling curriculum (Connected Math).

Data will drive instructional decision making; multiple assessments will be used in addition to daily performance assessments:

—results of state testing
—Options Publishing Company Diagnostic
(grade level equivalent) 3 times a year
—Teacher generated tests
—Corrective Math test generator and resulting
worksheets targeting student needs
—Corrective Math Pre-skill Tests and Placement Tests

Students will be assessed at least two times per week; results will be shared with students for feedback and goal setting. Data will be shared with mainstream teachers at least weekly.

Although this is a skills-based, direct instruction math support class, there will be many opportunities for differentiation as students will be grouped chronologically. One feature of Corrective Math is a "skip schedule" for students who have mastered specific skills.

Classroom expectations and processes will be clearly taught and monitored. Monday through Thursday there will be a minimum of 32 minutes of direct instruction. There are four computers in the classroom which may be used for differentiation. On Fridays, the computer room will be used to provide computer assisted instruction for up to three groups of students:

—Building Blocks
—Orchards Math
—journal writing
—vocabulary building
—use of math manipulatives and
—math problem solving using targeted skills.

All students should have access to calculators and individual white boards.

Students will be taught multiple problem solving strategies such as "guess, check and revise", estimation, "solve in a different way", "how do you know it is right", rounding up/down, etc. Daily oral math will be encouraged as well as use of number lines, calculators, memorization of some math facts, use of problem solving charts, etc.

In Math Support, the four basic operations will be emphasized until students "learn to mastery." If students have not refined a specific skill within two weeks, we will move to a related skill and then cycle back to prevent "student burnout." The teacher will help students make connections on how the learned math support skills will be used in their Connected Math class. The instructor will provide "push-in support" for each special education student in Connected Math. Push-in support may be provided for "unidentified students" as long as all special education students are receiving support.

Students will be strongly encouraged to enroll in the after-school SUN program to encourage homework completion. Math homework should supplement Connected Math concepts. Attendance will be closely

monitored because of the negative effect of absences on student achievement.

As with all teachers school wide, student expectations and classroom procedures will be thoroughly taught and implemented. The goal is to support quality instruction and student learning. ENVOY strategies and lesson design theory, begun in 2007, will be in evidence daily. Use of performance assessment will be encouraged.

Students will be grouped by grade level. As student math skills are very low and appear to cross all grade levels, there is a great deal of commonality in problem areas. Diagnostic testing and use of the data will be essential. Areas of deficit include but are not limited to:

—number sense is not understood with clarity
—students know multiplication by 2's, 5's, and 10's only
—students rely on fingers and slash marks instead of using manipulatives
—students do not use "carry on" as a strategy for addition
—students do not use "borrowing" as a strategy for subtraction
—students' math vocabulary is limited; vocabulary must be pre-taught in context
—lack of familiarity with the operation of division
—fractions are an unknown concept as are decimals and percentages
—problem solving strategies are limited or non-existent, i.e. estimation, mental math
—geometric sense is extremely limited as are the concepts on probability, ratio, proportion.

To: Lori Dunsmore, Principal
Washington School for the Deaf

Subject: Skill Building

I'm excited by the direction you are leading the staff and that they are embracing; skill building 30 minutes a day, 5 times a week for both reading and math. This should have great benefits for students. We all need to keep in mind that real change takes 3-5 years and stay the course.

With the model we are proposing, it may be a break in the "way things have been done" in the past.

- Skill groups need to be offered in the same time slot K-12 to allow for appropriate multi-age grouping. As you look at groupings that are being identified K-12, you may want to consider no more than a 4 year span of chronological ages in skill groups.

- Skill groups should be based on identified assessed student needs. What documentation do we have to show that the student is lacking the skill and how do we know they have acquired it at the end of two weeks or that they may need to repeat the skill building at another time? It is important that skills be aligned and not disconnected and that they not be continued more than 2 weeks in a row or students become discouraged and give up.

- Teachers in a level and between a level will need to meet bi-monthly to assess students' skill development and to re-assign skill groups.

- In math, students will have 60 minutes of "direct instruction" and 30 minutes of skill building 3 times a week. Student should have the 3-day focus in their weakest area, thus giving them 390 minutes per week of math instruction.

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- In reading, students will have 60 minutes of direct instruction in reading, plus 15 minutes daily of "value added" SSR plus and 30 minutes of skill building 3 times a week for a total of 465 minutes of reading instruction.

- Reading and writing instruction should be integrated, preferably in a block of time. Because of the size of your school, this may be difficult so the times could be separated as long as instruction is integrated.

- The Reading Achievement Prediction and Math Achievement Predictor should be given at least 3 times a year. You start the students at the level you think the student is, i.e., grade 8. If the student tests below grade 8, you make a strong guesstimate and keep testing until you find the appropriate level. One "size" of predictor does not fit the chronological ages of all children in that classroom.

- It is important that grade 11 and 12 students have 5 days of skill building even though they have taken the WASL. We need the 11-12th grade to continue to bring students closer to grade level. This could be accomplished by slightly modifying the existing Friday WASL schedule.

Monday-Tuesday		Reading	Rotate
Wednesday-Thursday		Math	
Friday	8:00 am	Safety	
	8:30 am	Skill Building	
	9:00 am	Reading	Rotate order to
	10:00 am	Writing	keep groups
	11:00 am	Math	small

With skill groups, to really teach and reinforce "deficient" skills, it is important K-10 that skills be taught "in a row", i.e.,
Monday, Tuesday, Wednesday — Reading
Thursday, Friday — Math

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IDEAS FOR MATH ASSESSMENT

— 3-2-1 things I know, concerns I have, questions I want answered
— comprehensive quizzes
— create and perform a math map
— create a video tape of how to solve problems
— create pictures, diagrams and charts for specific math concepts
— critical friends to share math problems or math solutions
— daily oral math (DOM)
— daily "tortures" or a problem a day related to content for warmup activity
— dear diary (math solutions)
— discuss how to solve the problem before you actually work it out with paper and pencil
— exhibitions of learning
— graph and/or table ... write the story the data represents
— graphic organizer for solving math problems
— K W L D sheet
— learning logs - what did you learn? - what do you still want to learn and explore?
— math vocabulary and spelling
— math portfolios
— math learning logs
— math manipulatives - model building using specific math concepts
— math scoring rubrics
— math solutions using think-pair-share
— math dictation: how to solve problems

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— math portfolio on computer disk - one for each student - travel from grade to grade
— math cartoons and captions
— math essays
— math logs/journals
— math research report with conclusion and why
— math goal setting
— math knowledge bowl
— math portfolio
— math scoring rubrics
— open ended student comment sheet
— open ended questions
— open ended problems - students need to supply missing information and solve
— participation points
— problems with errors - students trouble shoot
— quarterly parent newsletter about math
— re-telling how to solve problems
— read thinking stories; have children write solutions
— responding to essential questions
— revise and edit math journal to include reflections of learning
— solve in writing without using numbers
— solve in a different way
— solving math case studies
— student developed problems and solutions - have class discuss, with author as facilitator
— student led parent conferences
— student demonstrations of problem solving

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— student authored story problems
— student notes to parents with work samples (positive)
— student self assessment
— student developed progress report of skills
— survey of skills checklists
— student note to parents
— student reflection
— "take a risk" - go to the board, solve and explain why (give students bonus participation points)
— teacher observation and anecdotal records
— teacher made tests
— tell a story and then write it
— think alouds
— think-pair-share
— timelines of progress
— unit tests
— vocabulary bingo or quizzes
— what do you think and why?
— write a summary of new math learning
— word mapping with math vocabulary words
— write to a math prompt
— write a math poem
— write math jokes and commercials
— write math concept connections

WHAT ELSE CAN YOU ADD?

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SOME IDEAS FOR SIMPLE MATH ASSESSMENT

- Write three story problems that have five (5) as an answer.
- Write about your favorite number. Tell why it is your favorite.
- Make up a pattern and tell about it.
- Find out the favorite ice cream flavor for ten people you know. Invent a way to show this information to our class.
- Spin the spinner ten times. Tell what happened. Tell why you think it happened.
- What was easiest for you in today's math lesson? Why?
- What was hardest for you in today's math lesson? Why?
- What did you like most in math this week? Why?
- Write ten problems that use the number 10.
- Try to solve these problems mentally (no paper, pencil, or calculators). Write how you solved them.
- Write how you would tell a younger child to do the work we learned in math today.
- Make up ten math problems that you think are easy to do without paper, pencil, or calculator. Tell why you think they are easy.
- Tell me what you were thinking.
- How did you get your answer?
- How can you decide if it is right?
- Does it seem to make sense? Why or why not?
- Can you write a problem that is like it?
- Can you act it out?
- Can you show me a model of it?
- Can you draw a picture of what happened?

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Student Self Assessment

Rubric for Math - Extended Answer

4	• Answer is correct and stated in complete sentence(s). Conceptual understanding is demonstrated either in words or pictures.
3	• Answer is correct* and stated in complete sentence(s). Conceptual understanding is demonstrated either in words or pictures but is incomplete or incorrect (* Minor mathematical errors are included under this score).
2	• Answer is correct. No or little demonstration of conceptual understanding in either words or pictures. • Answer is incorrect but answered in correct format and attempted to demonstrate conceptual understanding.
1	• Answer is incorrect but attempted to use complete sentences and/or demonstrate conceptual understanding.
0	• Incorrect answer with little or no attempt at sentence form or conceptual understanding.
-1	• No response.

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Name_____ Date_____

Reflecting on What I've Read in Math

1. This reminds me of...

2. I remember when...

3. It makes me think of...

4. It makes me feel that...

5. That happened to me, too, when...

6. When I was young...

7. This situation is just like...

8. This is different from...

9. This compares to...

10. It sounds like...

What thoughts would you like to add?

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Reading Math Textbooks

1. Model how to read text and how to make sense of it.

2. Slow down reading rate.

3. Read and re-read with pen and paper; take notes, draw a diagram, use a graphic organizer, etc.

4. Add pauses to help you slow down and clarify what you have read; tell a partner; add additional ideas.

5. Draw and label diagrams as you read; solve a problem and label parts.

6. Think about related problems you already know how to do.

7. Follow the instructions carefully; don't skip steps!

8. Read figures and tables; they are important.

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9. Re-read; stop and ask yourself what the question is really asking. Look for questions that answer the question.

10. Try to answer the question for yourself before looking at the multiple choice answers.

11. Circle back and check again what you have read. Underline important information and circle or square what you are supposed to do.

12. Answer the questions in the order that works for you...just save enough time to complete your task!!

13. If you are using an answer sheet, check it. If you are writing answers, check to see that you have written what you were actually thinking.

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THINKING AT HIGHER LEVELS...

Describe how you would solve _____

_____

Analyze how this problem helps us to use mathematical thinking and problem solving.

Compare this problem to one on page _____
Contrast it to _____

Demonstrate how you could apply this problem at work or in real life _____

Change one or more numbers in the problem. Give a rule for what that change does.

Create an interesting and challenging word problem from the number problem. Show how to solve the problem.

Diagram or **illustrate** the solution to the problem...

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Where are we?

+ Areas of Strength

Why?

- Areas to Work On

What can we do?

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Washington School for the Deaf
Mathematics Grade K-12

Our Vision Statement:

Math comes alive through sign language...sign it, see it, feel it, do it!

Belief Statement:

We believe...

- Mathematics is a foundational skill that is essential for student success now and in their future.
- Students need multiple ways to learn.
- That students need to learn mathematical concepts, not isolated activities, and that teachers need to guide and support students to make learning connections.
- Real life applications of mathematical concepts are essential to math learning.
- Students learn math beyond paper and pencil activities and use of a textbook; they need multiple ways to "show what they know" to include use of standard math vocabulary and math sign language.
- Access to calculators and other assistive technology to enhance the learning process is a part of any K-12 comprehensive math program.
- Students need access to and practice with multiple strategies and techniques to apply math knowledge and understanding.
- Students need math concepts clearly communicated and clarified; teachers have the responsibility to frequently check for student understanding and to re-teach as needed.
- Students will be challenged to meet high expectations.
- In a commitment to academic support and learning interventions to meet student needs so that all students are at least at grade level.
- Instruction requires the intentional use of "best practices" in math instruction and the use of credible research.
- In the use of a variety of instructional strategies to meet the learning needs of each student.
- That students have the right to learn at a reasonable pace in an environment that promotes high expectations.
- That students need to see and be helped to make math learning connections to their future and their real world.
- That daily homework practice is essential to the learning of mathematics grades K-12. It is an expectation that homework will be relevant, purposeful, focused and used in the next day's lesson. Therefore, daily homework completion is the expectation.

Developed April, 2006
Matt Stefano, Bob Born, Judee Axelsen

Teaching is a means to an end!

Backward Design As Defined by Jay McTighe and Grant Wiggins

Stage 1 Identify Desired Results

- What should students know, understand and be able to do?
- What is worthy of understanding?
- What enduring understandings are wanted? What are the big ideas?
- What questions will foster further inquiry, understanding and transit of learning?
- What key knowledge and skills will students acquire as a result of this unit?

Stage 2 Determine Acceptable Evidence

- How will we know students have achieved desired results?
- How will we know students have met the content standards? (GLE's)
- What will be our evidence of student understanding and performing based on authentic performance tasks?
- How will students reflect and self assess their learning?
- What sequence of learning experiences and instruction will allow students to achieve the desired results?
- How will the design...
  - W Help students know <u>where</u> the unit is going and <u>what</u> is expected
  - H <u>Hook</u> all students and hold their interest
  - E <u>Equip</u> students to experience key ideas and explore issues
  - R Provide opportunities to <u>re-think</u> and <u>revise</u> their understandings and work
  - E Allow students to <u>evaluate</u> their work and its implications
  - T <u>Tailored</u> and personalized to meet the different needs, interest and abilities of learners
  - O <u>Organized</u> to maximize initial and sustained engagement for effective learning.

Stage 3 Planning Learning Experiences and Instruction

- What questions will uncover the big ideas we want students to understand?
- What knowledge and skills will students need to perform and demonstrate the desired results?
- What will need to be taught and coached?
- How will it best be taught?

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Questioning for Understanding

Explanation

- What is the key ideas in _____?
- What are examples of _____?
- What are the characteristics/parts of _____?
- How did this come about _____?
- What caused _____?
- What are the effects of _____?
- What might we confirm/prove/justify _____?
- How is_____animated for _____?
- What might happen in _____?
- What are the misconceptions about _____?

Interpretation

- What is the meaning of _____?
- What are the implications of _____?
- What does_____reveal about _____?
- How is_____like_____ analogy/metaphor?
- How does_____ relate to none/us?
- So what? Why does it matter _____?

Application

- How and when can we use this knowledge/process? _____
- How is _____ applied in the real world?
- How might_____help us to _____?
- How could we use_____to overcome _____?

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Questioning for Understanding continued

Perspectives

- What are the different points of view about _____?
- How might this look from_____'s perspective ____?
- How is_____similar to / different from_____?
- What are other possible reactions to _____?
- What are the strengths and weaknesses of _____?
- What are the limits of _____?
- What is the evidence for _____?
- Is the evidence reliable? Sufficient? _____

Empathy

- What would it be like to walk in_____ 's shoes?
- How might_____feel about_____?
- How might we reach an understanding about _____?
- What was _____ trying to make us feel/see?

Self Knowledge

- How do I know _____?
- What are the limits of my knowledge about _____?
- What are by "blind spots" about _____?
- How can I best show _____?
- How are my views about_____shaped by_____?
- What are my strengths and weaknesses in _____?

Understanding by Design
Jay McTyhe
Grant Wiggins

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Evidence of Learning

On-going self-evaluation and reflection

- What do you really understand about...
- What questions and uncertainties do you still have about...
- What was most effective in...
- What was least effective in...
- How could you improve...
- What are your strengths in...
- What are your deficiencies in...
- How difficult was...
- What would you do differently next time...
- What are you most proud of and why?...
- What are you most disappointed in and why?...
- How does what you've learned connect to other things you have learned?
- How does what you've learned changed your thinking?...
- How does what you've learned relate to the present and the future?...
- What follow-up is needed?...
- Other...

Understanding by Design
Jay McTyhe and Grant Wiggins

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TEXT BOOKS DON'T DRIVE INSTRUCTION - TEACHERS DO!

What do we teach?

How do we teach?

Why are we teaching these concepts/content?

How do we know students are learning?

What decision making strategies did we use to pick the particular methodologies in your lesson design?

How does this "fit" with a continuum of learning?

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What is negotiable ...

What is not ...

What does our data tell us...

What else do we need to know

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